providing a reactor having a single reaction space;

concurrently loading a batch of substrates into the single reaction space of the reactor;

introducing a gas containing reactants into the single reaction space, and chemically adsorbing a portion of the reactants on top surfaces of the substrates within the single reaction space; and

removing non-chemically adsorbed reactants from the single reaction space.

A2

2. (Once amended) The method of claim 1, further comprising, before the removing, diluting non-chemically adsorbed reactants in the single reaction space.

Sub B1

3. The method of claim 2, wherein said introducing the gas containing reactants is performed at a first predetermined pressure and said diluting is performed to a second predetermined pressure, and wherein the second predetermined pressure is greater than the first predetermined pressure.

4. The method of claim 3, wherein the first predetermined pressure is between approximately 0.1 Torr and approximately 0.5 Torr.

5. The method of claim 3, wherein said second predetermined pressure is greater than approximately 1.5 times the first predetermined pressure.

6. The method of claim 2, wherein said introducing the gas containing reactants is performed at a first predetermined pressure,

wherein said removing comprises pumping the reactor, thereby lowering the pressure of the reactor to a third predetermined pressure, and

wherein the third predetermined pressure is lower than the first predetermined pressure.

7. The method of claim 6, wherein the third predetermined pressure is lower than approximately 0.5 times the first predetermined pressure.

8. The method of claim 1, wherein said loading comprises transferring the batch of substrates using an automatic wafer transport mechanism.

9. A method of forming a thin film using atomic layer deposition (ALD), comprising:

providing a semiconductor substrate into a reactor;

introducing a gas containing reactants into the reactor at a first predetermined pressure, and chemically adsorbing a portion of the reactants on the substrate surface;

diluting non-chemically adsorbed reactants in the reactor such that the pressure of the reactor is increased to a second predetermined pressure; and

removing the diluted non-chemically adsorbed reactants from the reactor.

10. The method of claim 9, wherein the first predetermined pressure is between approximately 0.1 Torr and approximately 0.5 Torr.

11. The method of claim 9, wherein said second predetermined pressure is greater than approximately 1.5 times the first predetermined pressure.

12. The method of claim 9, wherein said removing is performed by pumping the reactor, thereby lowering the pressure of the reactor to a third predetermined pressure,

wherein the third predetermined pressure is lower than the first predetermined pressure.

13. The method of claim 12, wherein the third predetermined pressure is lower than approximately 0.5 times the first predetermined pressure.

14. The method of claim 9, wherein the reactor includes a pressure control valve connected to an exhaustion line for removing the diluted non-chemically adsorbed reactants and, wherein said diluting comprises substantially closing the control valve and supplying an inert gas into the reactor while substantially stopping the introduction of the gas containing reactants into the reactor.

15. The method of claim 9, wherein the reactor includes a pressure control valve connected to an exhaustion line and, wherein said diluting comprises supplying an inert gas with an amount substantially more than the amount of the gaseous reactants introduced into the reactor while stopping the introduction of the gaseous reactants into the reactor.

16. A method of forming a thin film using ALD, comprising:

providing a plurality of wafers into a single reactor;

introducing gaseous reactants into the single reactor at a first predetermined pressure, and chemically adsorbing a portion of the reactants on top surfaces of the plurality of substrates;

diluting non-chemically adsorbed reactants in the single reactor to a second predetermined pressure; and

removing the diluted non-chemically adsorbed reactants from the single reactor,

wherein said second predetermined pressure is greater than the first predetermined pressure.

Sub B1

17. The method of claim 16, wherein the reactor includes a pressure control valve connected to an exhaustion line and, wherein said diluting comprises substantially closing the control valve and supplying an inert gas into the reactor while stopping the introduction of the gaseous reactants into the reactor.

18. The method of claim 16, wherein the reactor includes a pressure control valve connected to an exhaustion line and, wherein said diluting comprises supplying an inert gas with an amount substantially more than the amount of the gaseous reactants into the reactor while stopping the introduction of the gaseous reactants into the reactor.

19. The method of claim 16, wherein the first predetermined pressure is between approximately 0.1 Torr and approximately 0.5 Torr.

20. The method of claim 16, wherein said second predetermined pressure is greater than approximately 1.5 times the first predetermined pressure.

21. The method of claim 16, wherein said removing is performed by pumping the chamber, thereby lowering the pressure of the reactor to a third predetermined pressure,

wherein the third predetermined pressure is lower than the first predetermined pressure.

22. The method of claim 21, wherein the third predetermined pressure is lower than approximately 0.5 times the first predetermined pressure.

23. The method of claim 16, wherein said removing is performed by pumping the chamber, thereby lowering the pressure of the reactor to a third predetermined pressure,

wherein the third predetermined pressure is lower than the first predetermined pressure.

24. The method of claim 16, wherein the reactor is a furnace-type reactor and, wherein substantially all the top surfaces of the substrates face the same direction for automated wafer transfer.

Sub B1

25. The method of claim 16, wherein the number of the plurality of substrates is more than one hundred.

26. The method of claim 16, wherein the reactor has a single reaction space for atomic layer deposition such that all of the substrates are placed within the single reaction space.

27. (Once amended) An atomic layer deposition (ALD) method of forming a thin film layer, comprising:

a) inserting one or more semiconductor substrates into a chamber;

b) introducing a first gaseous reactant into a reactor at a first predetermined pressure, and chemically adsorbing a portion of the reactants on the surfaces of the one or more substrates;

c) diluting non-chemically adsorbed first reactants in the reactor by injecting an inert gas into the chamber to increase the pressure of the reactor than the first predetermined pressure;

A3

d) removing the non-chemically adsorbed first reactants from the chamber;

e) introducing a second gaseous reactant into the reactor at a second predetermined pressure to form a single atomic layer by chemical exchange;

f) diluting non-chemically adsorbed reactants in the reactor such that the pressure of the reactor is increased; and

g) removing the non-chemically adsorbed reactants from the chamber.

28. The method of claim 27, wherein the first predetermined pressure is substantially the same as the second predetermined pressure.

29. The method of claim 27, wherein the first predetermined pressure is different from the second predetermined pressure.

30. The method of claim 27, wherein, during said first and second diluting, the reactor pressure is increased to not less than approximately 1.5 times the first and second predetermined pressure, respectively.

Sub B1

31. The method of claim 27, wherein said removing is performed by pumping the chamber to a third predetermined pressure substantially lower than either first or second predetermined pressure.

32. The method of claim 27, wherein the single atomic layer is an oxide layer of Al_2O_3, TiO_2, ZrO_2, HfO_2, Ta_2O_5, Nb_2O_5, CeO_2, Y_2O_3, SiO_2, In_2O_3, RuO_2, or IrO_2.

33. The method of claim 27, wherein the single atomic layer is a composite oxide layer of $SrTiO_3$, $PbTiO_3$, $SrRuO_3$, $CaRuO_3$, $(Ba,Sr)TiO_3$, $Pb(Zr,Ti)O_3$, $(Pb,La)(Zr,Ti)O_3$, $(Sr,Ca)RuO_3$, $(Ba,Sr)RuO_3$, Sn doped In_2O_3 (ITO), Fe doped In_2O_3, or Zr doped In_2O_3.

34. The method of claim 27, wherein the single atomic layer is a nitride layer of SiN, NbN, ZrN, TiN, TaN, Ya_3N_5, AlN, GaN, WN, or BN

35. The method of claim 27, wherein the single atomic layer is a complex nitride layer of WBN, WSiN, TiSiN, TaSiN, or AlTiN.

36. The method of claim 27, wherein the single atomic layer is a metal layer of Si, Al, Cu, Ti, Ta, Mo, Pt, Ru, Rh, Ir, W, or Ag.

37. The method of claim 27, wherein the single atomic layer is a silicide layer of Al, W, Ti, or Co.

38. The method of claim 27, wherein the single atomic layer is a metal silicate material ($M_{1-x}Si_xO_2$), the metal "M" being selected from the group consisting of hafnium (Hf), zirconium (Zr), tantalum (Ta), titanium (Ti), Cesium (Cs) and aluminum (Al).

39. The method of claim 27, further comprising the step of repeating at least one of steps (b) – (g).

40. (Once amended) A method of forming a thin film, comprising:

a) providing a reactor having a single reaction space;

b) concurrently loading the plurality of wafers having a processing surface into the reaction space, wherein the processing surfaces of the wafers face in substantially the same direction;

Sub B1 A4

c) introducing a first reactant into the reaction space, wherein a portion of the first reactant is chemically adsorbed on the processing surface of each of the plurality of wafers;

d) removing a non-chemically adsorbed portion of the first reactant from the reaction space;

e) introducing a second reactant into the reaction space, wherein a portion of the second reactant is chemically adsorbed on the processing surface of each of the plurality of wafers; and

f) removing a non-chemically adsorbed portion of the second reactant from the reaction space.

41. The method of claim 40, further comprising the step of repeating at least one of steps (c) – (f).

A5

42. (New) The method of claim 1, wherein the single reaction space is not partitioned.